TECHNICAL FISHERY REPORT 91-03

Alaska Department of Fish and Game
Division of Commercial Fisheries
P.O. Box 3-2000
Juneau, Alaska 99802

February 1991

Norton Sound and Kotzebue Sound Management Area

Salmon Catch and Escapement Statistics, 1989

by

Lawrence S. Buklis

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ACKNOWLEDGMENTS

The author would like to thank the Norton Sound-Kotzebue Sound Area staff for field data collection and ageing of all scale samples. Charlie Lean reviewed the preliminary draft of this report. Bob Wilbur, editor for the Division of Commercial Fisheries, facilitated final review and publication.

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ABSTRACT

The 1989 commercial and subsistence harvest of the five species of Pacific salmon (*Oncorhynchus*) found in the Norton Sound-Kotzebue Sound Area are presented by age, sex, and length. The 1989 Norton Sound District commercial harvest totaled 92,811 salmon and was comprised of 5,707 chinook, 42,625 chum, 123 pink, 265 sockeye, and 44,091 coho salmon. Effort and harvest were reduced due to lack of salmon markets during most of the season in the northern subdistricts. The commercial harvest was 44% below the recent 5-year (1984-88) average for chinook salmon, 69% below for chum salmon, and near average for coho salmon. Pink salmon harvests are typically small in odd-numbered years, but the negligible harvest in 1989 was attributable to the lack of a market. Sockeye salmon are only present in small numbers in this area. Escapement aerial survey assessment was very limited due to rain and high water. Chum salmon escapement to the Kwiniuk River was only 55% of the objective level based on a counting tower estimate. The chinook salmon harvest in the Unalakleet Subdistrict of Norton Sound was predominantly ages 1.4 (44.9%) and 1.3 (38.4%). Chum salmon harvest in the Shaktoolik and Unalakleet Subdistricts consisted of greater than 50% age 0.3 and greater than 40% age 0.4 fish. The coho harvest in the Unalakleet Subdistrict was mostly age 2.1 (91.0%), with no age 1.1 fish observed in the sample. In the Kotzebue District the harvest totaled 254,617 chum salmon and 87 chinook salmon. The chum salmon harvest was below the recent 10-year average of 334,500 fish. Escapement aerial surveys could not be conducted due to poor weather conditions and high water. Data from a test fishery on the Noatak River indicated that escapement to that system in 1989 was improved from the prior two years. The age composition of the chum salmon harvest in the Kotzebue District commercial fishery was 0.7% age 0.2, 77.9% age 0.3, 20.4% age 0.4, and 1.0% age 0.5.

KEY WORDS: Norton Sound, Kotzebue Sound, harvest, escapement, *Oncorhynchus tshawytscha*, *O. nerka*, *O. keta*, *O. kisutch*, *O. gorbuscha*, age-size-sex composition, fishery synopsis

INTRODUCTION

The Norton Sound, Port Clarence, and Kotzebue Sound commercial salmon management districts include all waters of Alaska from Canal Point Light, south of Stebbins, to Point Hope, north of Kotzebue. The Port Clarence District located within this area has been closed to commercial salmon fishing since 1966. The Norton Sound District is comprised of all waters of Alaska from Canal Point Light north to Cape Douglas (Figure 1). This district consists of six subdistricts: Nome (Subdistrict 1), Golovin (Subdistrict 2), Moses Point (Subdistrict 3), Norton Bay (Subdistrict 4), Shaktoolik (Subdistrict 5), and Unalakleet (Subdistrict 6). The Kotzebue Sound District includes all waters of Alaska from Point Hope to Cape Prince of Wales, but commercial salmon fishing is restricted to Subdistricts 1 and 2, consisting of ocean waters north of the Baldwin Peninsula (Figures 2 and 3). Subdistrict 2 normally remains closed unless a chum salmon return substantially above average warrants opening this area at the mouth of the Noatak River.

Five species of Pacific salmon are found in the Norton and Kotzebue Sound areas. They are, in descending order of economic importance (average ex-vessel value), chum salmon (*Oncorhynchus keta*), chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*). Numerically, the even-year returns of pink salmon are the largest of the five species followed by chum, coho, chinook, and sockeye salmon.

Knowledge of the magnitude, distribution, timing, and age-sex-size composition of both the harvest and escapement by stock is fundamental to managing salmon fisheries and achieving full production; i.e., salmon recruitment is directly related to the number of fish in each age, sex, and size category of the spawning population (escapement). Therefore, the age, sex, and size composition for selected harvests and escapements in the Norton and Kotzebue Sound areas have been estimated annually since 1962 and are presented in this report for 1989.

Basic fishery statistics for the Norton Sound-Kotzebue Sound Area are available from several additional sources. Commercial and subsistence harvest and spawning escapement data for the years 1961 to 1989 are available from ADF&G (*In press*). In addition, the results from escapement assessment projects are analyzed and reported annually. For the 1989 season these included test fishery projects on the Unalakleet River (Lean 1990a) and Noatak River (Kneupfer 1990) and a counting tower project on the Kwiniuk River (Lean 1990b). Age, sex, and size data for Norton Sound and Kotzebue Sound from 1962 to 1982 are summarized in an unpublished report series entitled ADF&G Arctic-Yukon-Kuskokwim Region Age-Sex-Size Composition of Salmon. Beginning with the 1983 season, these data have been published in an annual report (Lean et. al. 1984; Bigler and Lean 1986; Hamner 1987, 1989a, 1989b; Buklis *In press*).

METHODS

Harvest and Escapement

Commercial catch data presented in this report were compiled from harvest receipts (fish tickets) which document each sale by a licensed fisherman. These data were summarized by microcomputer in the Nome area office and the Kotzebue seasonal office during the commercial fishing season.

Subsistence catches have not been monitored as closely as commercial catches in the Norton Sound-Kotzebue Sound Area. Due to budget constraints, no subsistence harvest surveys were conducted in the Norton Sound area in 1989. A subsistence permit is required to subsistence fish in the Nome Subdistrict and catch limits are set by permit for each river and species. In the Kotzebue Area household interviews were conducted in several villages. The members of each household were asked how many fish of each species were caught for subsistence use. During these surveys it was assumed that fishermen could accurately recall their harvests, which may have occurred over several weeks. The reported subsistence harvests are estimates of total catch for each village surveyed. A mean catch per fishing family was calculated for each village surveyed. This mean was applied to those families known to have fished but unavailable for interview.

Aerial surveys have been the primary method for monitoring salmon escapement in the Norton Sound and Kotzebue Sound drainages. They have not provided a total enumeration of salmon spawning abundance. Ideally, a series of these surveys are conducted on approximately the same dates under similar survey conditions, and can be compared across years. Therefore, aerial survey escapement counts should be regarded as an index of relative abundance for the surveyed streams. Test fishing catches provide an index of escapement and species composition for turbid or large drainages that are difficult to monitor visually. Test fishery catch and catch per unit of effort (CPUE) statistics are used as an index of relative abundance. Counting towers provide a better estimate of escapement. Test fisheries and counting towers both provide data on migratory timing. In 1989 a counting tower on the Kwiniuk River in the Moses Point Subdistrict and test fishing projects on the Unalakleet River in the Unalakleet Subdistrict and the Noatak River in the Kotzebue District were used to monitor escapements.

Age, Sex, and Length Data Collection

Age was determined from scales removed from the left side of the fish in an area above the lateral line and crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales were mounted on gum cards and impressions made in cellulose acetate. Ages were reported in European notation (the first digit refers to the freshwater age and does not include the year spent in the gravel; the second digit refers to the ocean age). Sex was determined by examining external morphology (snout, vent, body symmetry) extruded eggs, ovipositor or milt of live fish. The sex of dead fish was deter-

mined by examining the gonads, if necessary. Fish length from mid-eye to fork-of-tail was measured to the nearest millimeter.

In some cases sex and length data were obtained without ageable scales, while in other cases ageable scales were collected without the corresponding sex or length data. Therefore, numbers of fish in a length-by-age summary table may differ from numbers of fish in a sex-by-age summary table for a given fishery or escapement sample. Additionally, the total number of fish in an age category for a sample may be greater than the sum of females and males for that category.

Sample Size

Minimum sample size goals within temporal strata for 1989 were derived in a different manner from prior years that resulted in substantially reduced sample size requirements (R. Conrad, Alaska Department of Fish and Game, Anchorage, personal communication). These reduced requirements were due to a change in recommended levels of accuracy and precision, as well as a different way of assigning variance to age classes. The objective was to obtain an estimated proportion by age class that was within 10 percentage points of the true proportion 95% of the time. This resulted in a per strata sample size goal of 128 fish scale samples regardless of the number of age classes expected. Actual collection goals required that sample sizes be increased to include an expected proportion of unreadable scales. In cases where the total number of readable samples collected was less than the goal, data from several strata were pooled, and a standard error of the mean was calculated.

RESULTS

Commercial fishery samples were collected in sufficient numbers to estimate age and sex composition of the harvest for: 1) chinook, chum, and coho salmon in the Unalakleet Subdistrict of Norton Sound; 2) chum salmon in the Shaktoolik Subdistrict of Norton Sound; and 3) chum salmon in the Kotzebue District. Additional samples were collected in small numbers from commercial chinook catches in the Shaktoolik Subdistrict and from commercial and subsistence chum catches in the Moses Point Subdistrict. Chinook, chum, and coho salmon were sampled from the Unalakleet River set gill net test fishing catch, while chum salmon were sampled from the Noatak River drift gill net test fishing catch. Due to the selectivity of the 149 mm (5-7/8 in) stretched-mesh gill nets used on these two projects, the sample compositions are not an unbiased estimator of spawning escapement age, sex, and size composition. Kotzebue Sound chum salmon escapement samples were collected from the Noatak River spawning grounds by beach seine, and by carcass collection from the Squirrel River spawning grounds in the Kobuk River drainage.

Comparisons of age, sex, and size composition were not substantiated by statistical testing.

Norton Sound

Commercial and Subsistence Harvest

The 1989 Norton Sound commercial harvest totaled 92,811 salmon and was comprised of 5,707 chinook, 42,625 chum, 123 pink, 265 sockeye, and 44,091 coho salmon (Table 1; Appendix A). Effort and harvest were reduced due to a lack of salmon markets during most of the season in the four northern subdistricts. The Unalakleet Subdistrict accounted for 66% of the total salmon harvest in 1989, followed by the Shaktoolik (31%), Moses Point (2%), and Nome (1%) Subdistricts.

The chinook salmon harvest was 44% below the 1984-88 average and comprised 6% of the district's total salmon harvest. Most fishermen in the Unalakleet and Shaktoolik Subdistricts target on chinook salmon from the opening of the season in mid-June to the end of June using set gill nets with 210 mm (8-1/4 in) stretched mesh. During this portion of the season, fishing periods in these two subdistricts are reduced to 24 h from the normal 48 h to provide for adequate chinook escapements. North of Shaktoolik Subdistrict, fishermen typically use 149 mm (5-7/8 in) mesh gill nets throughout the fishing season and target on chum salmon, with chinook salmon harvested incidentally.

Chum salmon, the most economically important (ex-vessel value) species in Norton Sound, comprised 46% of the district's total harvest in 1989. The 1989 harvest was 69% below the 1984-88 average. Pink salmon returns in Norton Sound follow an even-year cycle of high abundance, but the negligible harvest in 1989 was attributable to the lack of a market. Sockeye salmon are harvested in small numbers incidental to chum salmon. The coho salmon harvest was the fourth largest on record but 5% below the 1984-88 average, and accounted for 48% of the district's total salmon catch.

Although many of the 13,000 residents of the Norton Sound area are dependent to varying degrees on the fish and game resources of the area, subsistence catches have not been monitored since 1983, except in the Nome Subdistrict. Prior to 1983 the department conducted annual household surveys in many of the villages in the area. For the last 5 years in which complete surveys were conducted (1978-82), the average subsistence catch in the Norton Sound area was 73,000 salmon of all species combined; since not all fishermen were contacted, this should be considered a minimum estimate. In the Nome Subdistrict, subsistence permits require that fishermen document their harvest by species. One hundred and sixty subsistence permits were issued in 1989. Seventy-seven of these were fished and resulted in a harvest of 4,306 salmon: 14 chinook, 3,113 chum, 733 pink, 96 sockeye, and 350 coho salmon (Table 2).

Escapement Abundance

Escapement aerial survey assessment was very limited in 1989 due to rain and high water (Table 3). The Unalakleet and Shaktoolik subdistricts support the major chinook salmon returns in Norton Sound, although the Norton Bay, Moses Point, and Golovin Subdistricts have demonstrated increasing returns in recent years. The

only chinook escapement count obtained in 1989 was from the Kwiniuk River counting tower in the Moses Point Subdistrict. The count of 232 chinook was below the 1979-88 average of 356 fish. The Unalakleet River test fishery indicated an early return of average magnitude to that system.

Chum salmon escapement to the Kwiniuk River was only 55% of the objective level based on a counting tower estimate. Aerial survey counts of chum and pink salmon for the Eldorado, Sinuk, and Solomon Rivers in the Nome Subdistrict were obtained in August while surveying for coho salmon. Since timing of the surveys was past peak spawning activity for chum and pink salmon the resulting counts are very minimal estimates and not comparable to objective levels.

Coho salmon are found in nearly all of the chum salmon producing streams in Norton Sound, although the Unalakleet and Shaktoolik River systems support the largest populations. Due to poor weather conditions surveys of the major coho salmon stocks could not be conducted. However, surveys indicated poor coho escapements in the northern portion of Norton Sound. Counts of 375 cohos for the Nome River, 87 for the Eldorado River, 75 for the Sinuk River, and 25 for the Solomon River were below average.

Age, Sex, and Length Composition

Chinook salmon commercial harvest in the Unalakleet Subdistrict was 44.9% age-1.4 and 38.4% age-1.3, with ages 1.2 and 1.5 contributing smaller percentages (Table 4). Females were estimated to contribute 42.0% to the harvest. A small sample from the Shaktoolik commercial harvest was also dominated by ages 1.4 and 1.3 (Table 5). A sample of 41 chinook from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 53.7% age 1.3 and 31.7% age 1.4 and 70.7% male (Table 5). Mean lengths by age group for all samples collected ranged from 477 mm for age 1.2 males from the Unalakleet River test fishery sample to 920 mm for age 1.5 females from the Unalakleet commercial fishery sample (Table 6).

The chum salmon commercial harvest in the Shaktoolik and Unalakleet Subdistricts was greater than 50% age 0.3 and greater than 40% age 0.4 (Tables 7 and 8). Females were estimated to contribute 37.1% and 46.4% to the harvest in each of these subdistricts, respectively. Small samples from the Moses Point commercial and subsistence fishery harvests were dominated by age 0.4 (Table 9). A sample of 727 chum salmon from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 47.7% age 0.3 and 50.6% age 0.4 and 39.5% female (Table 9). Mean lengths by age group for all samples collected ranged from 503 mm for an age-0.3 female from the Moses Point subsistence fishery sample to 627 mm for age-0.4 males from the Shaktoolik commercial fishery sample (Table 10).

Coho salmon commercial harvest in the Unalakleet Subdistrict was 91.0% age 2.1 and 9.0% age 3.1, with age 1.1 not present in the sample (Table 11). Females were estimated to contribute 45.5% to the harvest. A sample of 142 coho from the Unalakleet River test fishery using 149 mm (5-7/8 in) mesh gill nets was 96.5% age 2.1, 2.8% age 3.1, and 0.7% age 1.1 and 53.5% female (Table 12). Mean lengths by age group for all samples collected ranged from 543 mm for an age-1.1 female to 600 mm for an age-3.1 male, both from the Unalakleet River test fishery sample (Table 12).

Kotzebue Sound

Commercial and Subsistence Harvest

The 1989 commercial harvest of salmon in the Kotzebue District totaled 254,617 chum salmon and 87 chinook salmon (Table 14). The harvest was 24% below the 1979-88 average of 334,500 fish (Appendix B). After the first 3 fishing periods of near average catches, catch rates dropped below average. Therefore, fishing periods remained 24 h in duration until 7 August, except for one 36 h period 31 July. Improved run strength allowed for an increase to 36 h periods beginning 7 August and 48 h periods beginning 10 August. The peak catch of 44,741 chum salmon occurred during the 9th period (8/7 to 8/8). Commercial fishing gear in the Kotzebue area consists of set gill nets of 140 mm (5-1/2 in) to 152 mm (6 in) stretched mesh, and up to 274 m (150 fm) in aggregate length per fisherman.

Door-to-door subsistence fishermen interviews were conducted in the villages of Shungnak and Noorvik on the Kobuk River in September, and in the village of Noatak on the Noatak River in November (Table 15). Estimated chum salmon subsistence harvests totalled 7,568 in Noorvik, 3,894 in Shungnak, and 1,595 in Noatak. These were not total subsistence harvest estimates for the Kotzebue Sound area in that the town of Kotzebue and several villages which harvest chum salmon for subsistence were not surveyed.

Escapement Abundance

Escapement aerial surveys could not be conducted in 1989 due to rain and high water. Data from a test fishery on the Noatak River indicated that escapement to that system was improved from the prior two years.

Age, Sex, and Length Composition

Sufficient commercial fishery catch samples were collected to stratify the season by fishing period (Appendix B). A shift in age composition through the season was once again noted for 1989, with age-0.4 decreasing and age-0.3 increasing as the season progressed. For the first fishing period, 56.8% of the catch was age 0.4 and 41.9% was age 0.3, while for the fifteenth period 7.3% of the catch was age 0.4 and 88.1% was age 0.3. Ages 0.2 and 0.5 contributed only small percentages, but followed the timing pattern of older fish earlier in the run and younger fish later. One age-0.6 fish was observed in the sample. The chum salmon commercial harvest for the entire season was comprised of 77.9% age 0.3, 20.4% age 0.4, 1.0% age 0.5, and 0.7% age 0.2 (Table 16). Females were estimated to contribute 50.7% to the harvest. During the prior 10 year period (1979-88), age 0.3 averaged 58.7% and age 0.4 averaged 29.1% of the commercial harvest in the Kotzebue District (Appendix B).

Additional samples were collected from the test fishery located in the lower Noatak River using 149 mm (5-7/8 in) mesh gill nets (age data only), and from the

Noatak and Squirrel River spawning grounds. Age 0.3 accounted for 83.2% to 90.4%, and females accounted for 51.1% to 67.9% of these escapement samples (Table 17).

Mean lengths by age group for all samples collected ranged from 475 mm for age-0.2 females from the Squirrel River escapement carcass sample to 690 mm for an age-0.5 male from the Noatak River escapement beach seine sample (Table 18).

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Table 1. Norton Sound commercial salmon effort and catch (numbers) by subdistrict, 1989.

Subdistrict	Fisher-men	Catch (nos.)					
		Chinook	Chum	Pink	Sockeye	Coho	Total
Nome	2	2	492	123	0	0	617
Golovin	0	0	0	0	0	0	0
Moses Point	13	62	1,667	0	0	0	1,729
Norton Bay	0	0	0	0	0	0	0
Shaktoolik	26	1,241	19,641	0	43	8,066	28,991
Unalakleet	73	4,402	20,825	0	222	36,025	61,474
District Totals	110[a]	5,707	42,625	123	265	44,091	92,811

[a] Total fishermen is total number of fishing permits used during the 1989 season in Norton Sound.

Table 2. Subsistence salmon effort and catch in Nome, Norton Sound Subdistrict 1, 1989.

Location	Permits Issued	Permits Returned	Permits Used	Catch (nos.)[a] Chinook	Chum	Pink	Sockeye	Coho	Total
Nome R.	17	11	9	0	57	68	0	77	202
Marine Waters	84	64	39	10	1,870	394	60	153	2,487
Sinuk R.	1	1	1	0	0	1	0	1	2
Eldorado R.	21	18	10	0	1,104	194	33	50	1,381
Flambeau R.	6	3	2	0	34	4	0	4	42
Snake R.	12	8	7	1	10	10	3	16	40
Penny R.	1	0	0	0	0	0	0	0	0
Solomon R.	2	2	1	0	0	0	0	0	0
Bonanza R.	11	8	6	3	34	62	0	29	128
Cripple R.	3	3	2	0	4	0	0	20	24
Safety Sound	2	2	0	0	0	0	0	0	0
Totals	160	120	77	14	3,113	733	96	350	4,306

[a] Harvested by beach seine or set gill net.

Table 3. Salmon aerial survey escapement counts in Norton Sound in 1989 by species, with index escapement goals for chum salmon.

Subdistrict	Stream	Chinook	Chum		Pink	Coho
			Goal[a]	Count		
Nome (1)	Nome	2[c]	2,000	72[b,c]	1,365[b,c]	375
	Eldorado		5,300	350[c]	1,550[c]	87
	Sinuk			1,025[c]	26,850[c]	75
	Solomon			60[c]	1,370[c]	25
Golovin (2)	Niukluk					182[d]
Moses Pt. (3)	Kwiniuk[e]	232	25,000	13,689	30,275	

[a] Index escapement goals have only been developed for chum salmon and are based on the average of historical peak aerial survey counts with "good" or "fair" ratings. Goals are shown only for those streams with chum salmon survey counts in 1989.
[b] Boat survey.
[c] Poor survey conditions or non-peak timing resulting in minimal count.
[d] Includes 70 coho salmon counted in Ophir Creek.
[e] Preliminary expanded tower counts. Chum salmon escapement goal for Kwiniuk River is based on historical tower count data.

Table 4. Chinook salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1989.

		Brood Year and Age Group				
		1985	1984	1983	1982	
		1.2	1.3	1.4	1.5	Total
Stratum Dates:	6/15-9/06					
Sample Dates:	6/16-6/24					
Sample Size:	138					
Female	Percent	0.0	13.0	25.4	3.6	42.0
	Catch	0	574	1,116	159	1,850
Male	Percent	13.0	25.4	19.6	0.0	58.0
	Catch	574	1,116	861	0	2,552
Total	Percent	13.0	38.4	44.9	3.6	100.0
	Catch	574	1,691	1,978	159	4,402
	Std Error	127	183	187	70	

Table 5. Age and sex composition of chinook salmon samples from Norton Sound commercial and test fisheries, 1989.

		Brood Year and Age Group				
		1985	1984	1983	1982	
		1.2	1.3	1.4	1.5	Total
Shaktoolik (Subdistrict 5) Commercial GN Sample Dates: 6/24						
Female	Sample Size	0	3	5	0	8
	Percent	0.0	23.1	38.5	0.0	61.5
Male	Sample Size	1	3	1	0	5
	Percent	7.7	23.1	7.7	0.0	38.5
Total	Sample Size	1	6	6	0	13
	Percent	7.7	46.2	46.2	0.0	100.0
	Std Error	7.7	14.4	14.4	0.0	
Unalakleet River Test GN[a] Sample Dates: 6/13-7/10						
Female	Sample Size	0	5	6	1	12
	Percent	0.0	12.2	14.6	2.4	29.3
Male	Sample Size	5	17	7	0	29
	Percent	12.2	41.5	17.1	0.0	70.7
Total	Sample Size	5	22	13	1	41
	Percent	12.2	53.7	31.7	2.4	100.0
	Std Error	5.2	7.9	7.4	2.4	

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 6. Mean length (mm) by age and sex for chinook salmon samples from Norton Sound commercial and test fisheries, 1989.

		Brood Year and Age Group			
		1985	1984	1983	1982
		1.2	1.3	1.4	1.5
Shaktoolik (Subdistrict 5) Commercial GN Sample Dates: 6/24					
Female	Mean Length	-	728	911	-
	Std. Error	-	43.1	29.4	-
	Sample Size	0	3	5	0
Male	Mean Length	585	710	910	-
	Std. Error	0.0	15.8	0.0	-
	Sample Size	1	3	1	0
Unalakleet (Subdistrict 6) Commercial GN Sample Dates: 6/16-6/24					
Female	Mean Length	-	791	855	920
	Std. Error	-	13.0	8.9	25.9
	Sample Size	0	18	35	5
Male	Mean Length	553	737	833	-
	Std. Error	9.0	11.9	16.9	-
	Sample Size	18	35	27	0
Unalakleet River Test GN[a] Sample Dates: 6/13-7/10					
Female	Mean Length	-	825	863	865
	Std. Error	-	30.0	19.0	0.0
	Sample Size	0	5	6	1
Male	Mean Length	477	697	818	-
	Std. Error	53.3	11.8	19.2	-
	Sample Size	5	17	7	0

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 7. Chum salmon commercial catch by age and sex in Shaktoolik, Norton Sound Subdistrict 5, 1989.

		Brood Year and Age Group			
		1985	1984	1983	
		0.3	0.4	0.5	Total
Stratum Dates:	6/15-8/19				
Sample Dates:	7/05				
Sample Size:	159				
Female	Percent	17.6	18.2	1.3	37.1
	Catch	3,459	3,582	247	7,288
Male	Percent	34.0	25.2	3.8	62.9
	Catch	6,671	4,941	741	12,353
Total	Percent	51.6	43.4	5.0	100.0
	Catch	10,129	8,523	988	19,641
	Std Error	781	774	342	

Table 8. Chum salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1989.

		Brood Year and Age Group			
		1985	1984	1983	
		0.3	0.4	0.5	Total
Stratum Dates:	6/15-9/06				
Sample Dates:	7/04-8/05				
Sample Size:	446				
Female	Percent	22.0	24.4	0.0	46.4
	Catch	4,576	5,090	0	9,665
Male	Percent	33.6	19.7	0.2	53.6
	Catch	7,004	4,109	47	11,160
Total	Percent	55.6	44.2	0.2	100.0
	Catch	11,580	9,198	47	20,825
	Std Error	490	490	47	

Table 9. Age and sex composition of chum salmon samples from Norton Sound commercial, subsistence, and test fisheries, 1989.

		Brood Year and Age Group				
		1986	1985	1984	1983	
		0.2	0.3	0.4	0.5	Total
Moses Point (Subdistrict 3) Commercial GN						
Sample Dates: 6/29						
Female	Sample Size	0	5	7	0	12
	Percent	0.0	19.2	26.9	0.0	46.2
Male	Sample Size	0	4	10	0	14
	Percent	0.0	15.4	38.5	0.0	53.8
Total	Sample Size	0	9	17	0	26
	Percent	0.0	34.6	65.4	0.0	100.0
	Std Error	0.0	9.5	9.5	0.0	
Moses Point (Subdistrict 3) Subsistence GN						
Sample Dates: 6/27						
Female	Sample Size	0	1	3	0	4
	Percent	0.0	5.3	15.8	0.0	21.1
Male	Sample Size	0	3	11	1	15
	Percent	0.0	15.8	57.9	5.3	78.9
Total	Sample Size	0	4	14	1	19
	Percent	0.0	21.1	73.7	5.3	100.0
	Std Error	0.0	9.6	10.4	5.3	
Unalakleet River Test GN[a]						
Sample Dates: 6/12-9/01						
Female	Sample Size	1	118	160	8	287
	Percent	0.1	16.2	22.0	1.1	39.5
Male	Sample Size	0	229	208	3	440
	Percent	0.0	31.5	28.6	0.4	60.5
Total	Sample Size	1	347	368	11	727
	Percent	0.1	47.7	50.6	1.5	100.0
	Std Error	0.1	1.9	1.9	0.5	

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 10. Mean length (mm) by age and sex for chum salmon samples from Norton Sound commercial, subsistence, and test fisheries, 1989.

		Brood Year and Age Group			
		1986	1985	1984	1983
		0.2	0.3	0.4	0.5
Moses Point (Subdistrict 3) Commercial GN Sample Dates: 6/29					
Female	Mean Length	-	567	596	-
	Std. Error	-	9.3	7.1	-
	Sample Size	0	5	7	0
Male	Mean Length	-	569	598	-
	Std. Error	-	12.4	12.6	-
	Sample Size	0	4	10	0
Moses Point (Subdistrict 3) Subsistence GN Sample Dates: 6/27					
Female	Mean Length	-	503	585	-
	Std. Error	-	0.0	14.4	-
	Sample Size	0	1	3	0
Male	Mean Length	-	583	595	622
	Std. Error	-	11.5	10.1	0.0
	Sample Size	0	3	11	1
Shaktoolik (Subdistrict 5) Commercial GN Sample Dates: 7/05					
Female	Mean Length	-	574	594	589
	Std. Error	-	3.4	4.7	39.0
	Sample Size	0	28	29	2
Male	Mean Length	-	585	627	615
	Std. Error	-	3.4	5.2	12.1
	Sample Size	0	54	40	6

- Continued -

Table 10. (page 2 of 2)

		Brood Year and Age Group			
		1986	1985	1984	1983
		0.2	0.3	0.4	0.5
Unalakleet (Subdistrict 6) Commercial GN Sample Dates: 7/04-8/05					
Female	Mean Length	-	556	586	-
	Std. Error	-	2.1	2.2	-
	Sample Size	0	97	109	0
Male	Mean Length	-	578	614	575
	Std. Error	-	2.1	3.3	0.0
	Sample Size	0	150	88	1
Unalakleet River Test GN[a] Sample Dates: 6/12-9/01					
Female	Mean Length	548	574	596	599
	Std. Error	0.0	2.2	1.9	11.2
	Sample Size	1	118	159	8
Male	Mean Length	-	586	620	622
	Std. Error	-	1.8	2.0	15.0
	Sample Size	0	229	208	3

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 11. Coho salmon commercial catch by age and sex in Unalakleet, Norton Sound Subdistrict 6, 1989.

		Brood Year and Age Group		
		1985	1984	
		2.1	3.1	Total
Stratum Dates:	7/10-9/06			
Sample Dates:	7/26-8/05			
Sample Size:	156			
Female	Percent	40.4	5.1	45.5
	Catch	14,549	1,847	16,396
Male	Percent	50.6	3.8	54.5
	Catch	18,243	1,386	19,629
Total	Percent	91.0	9.0	100.0
	Catch	32,792	3,233	36,025
	Std Error	827	827	

Table 12. Age and sex composition of coho salmon samples from Norton Sound test fishery, 1989.

		Brood Year and Age Group			
		1986	1985	1984	
		1.1	2.1	3.1	Total
Unalakleet River Test GN[a] Sample Dates: 7/13-9/10					
Female	Sample Size	1	72	3	76
	Percent	0.7	50.7	2.1	53.5
Male	Sample Size	0	65	1	66
	Percent	0.0	45.8	0.7	46.5
Total	Sample Size	1	137	4	142
	Percent	0.7	96.5	2.8	100.0
	Std Error	0.7	1.6	1.4	

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 13. Mean length (mm) by age and sex for coho salmon samples from Norton Sound commercial and test fisheries, 1989.

		Brood Year and Age Group		
		1986	1985	1984
		1.1	2.1	3.1
Unalakleet (Subdistrict 6) Commercial GN Sample Dates: 7/26-8/05				
Female	Mean Length	-	572	578
	Std. Error	-	4.4	5.3
	Sample Size	0	63	8
Male	Mean Length	-	578	575
	Std. Error	-	4.5	20.2
	Sample Size	0	79	6
Unalakleet River Test GN[a] Sample Dates: 7/13-9/10				
Female	Mean Length	543	574	559
	Std. Error	0.0	3.5	19.3
	Sample Size	1	72	3
Male	Mean Length	-	574	600
	Std. Error	-	4.9	0.0
	Sample Size	0	65	1

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 14. Kotzebue District commercial salmon set gill net effort and catch by fishing period, 1989.

Period	Period Dates	Period Hours	No. of Fishermen	Catch (nos.) Chinook	Chum
1	7/10-7/11	24	53	1	2,312
2	7/13-7/14	24	74	17	5,950
3	7/17-7/18	24	90	5	11,397
4	7/20-7/21	24	97	10	8,381
5	7/24-7/25	28	103	7	16,145
6	7/27-7/28	24	108	6	12,736
7	7/31-8/01	36	122	7	24,918
8	8/03-8/04	24	123	8	28,887
9	8/07-8/08	36	127	3	44,741
10	8/10-8/12	48	138	8	42,046
11	8/14-8/16	48	126	5	31,787
12	8/17-8/19	48	80	2	7,973
13	8/21-8/23	48	65	4	10,408
14	8/24-8/26	48	35	2	4,545
15	8/28-8/30	48	17	2	2,391
Season Total		532	165[a]	87	254,617

[a] Total fishermen is total number of fishing permits used during the 1989 season in Kotzebue District.

Table 15. Subsistence salmon effort and catch in Noatak, Noorvik, and Shungnak, Kotzebue District, 1989.

Village	Number of Fishermen	Chum Salmon Harvest	Average Catch per Fisherman
Noatak	12	1,595	133
Noorvik	22	7,568	344
Shungnak	18	3,894	216
Survey Total[a]	52	13,057	251

[a] Subsistence catch estimated by direct interview of available fishermen in three villages. Resulting estimates were expanded for subsistence fishermen not contacted. Salmon were harvested for subsistence in several other villages in the area. These were not surveyed due to budget and staff limitations.

Table 16. Chum salmon commercial catch by age and sex in Kotzebue District for the entire season based upon sample data stratified by fishing period, 1989.

		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	7/10-8/30						
Sample Dates:	7/11-8/30[a]						
Sample Size:	3,336						
Female	Percent	0.1	38.9	11.0	0.6	0.0	50.7
	Catch	373	99,077	28,111	1,441	27	129,029
Male	Percent	0.6	38.9	9.3	0.5	0.0	49.3
	Catch	1,427	99,149	23,675	1,197	0	125,448
Total	Percent	0.7	77.9	20.4	1.0	0.0	100.0
	Catch	1,800	198,226	51,926	2,638	27	254,617
	Std Error	464	2,164	2,086	527	27	

[a] Sufficient samples were collected to estimate age and sex composition by fishing period, which were summed to provide season totals. Data are presented by fishing period in Appendix B.1.

Table 17. Age and sex composition of chum salmon samples from Kotzebue District test fishery and escapement, 1989.

		Brood Year and Age Group				
		1986	1985	1984	1983	
		0.2	0.3	0.4	0.5	Total
Noatak River Test GN[a]						
Sample Dates: 7/18-8/24						
Total	Sample Size	8	1,398	249	20	1,675
	Percent	0.5	83.5	14.9	1.2	100.0
	Std Error	0.2	0.9	0.9	0.3	
Noatak River Escapement BS						
Sample Dates: 9/16-9/26						
Female	Sample Size	1	108	8	0	117
	Percent	0.4	47.2	3.5	0.0	51.1
Male	Sample Size	1	99	11	1	112
	Percent	0.4	43.2	4.8	0.4	48.9
Total	Sample Size	2	207	19	1	229
	Percent	0.9	90.4	8.3	0.4	100.0
	Std Error	0.6	2.0	1.8	0.4	
Squirrel River Escapement Carcasses						
Sample Dates: 9/06-9/07						
Female	Sample Size	2	147	32	1	182
	Percent	0.7	54.9	11.9	0.4	67.9
Male	Sample Size	1	76	8	1	86
	Percent	0.4	28.4	3.0	0.4	32.1
Total	Sample Size	3	223	40	2	268
	Percent	1.1	83.2	14.9	0.7	100.0
	Std Error	0.6	2.3	2.2	0.5	

[a] Gill net mesh size was 149 mm (5-7/8 in) stretch measure.

Table 18. Mean length (mm) by age and sex for chum salmon samples from Kotzebue District commercial fishery and escapement, 1989.

		Brood Year and Age Group				
		1986	1985	1984	1983	1982
		0.2	0.3	0.4	0.5	0.6
Kotzebue Commercial GN Sample Dates: 7/11-8/30						
Female	Mean Length	544	585	617	613	602
	Std. Error	8.3	0.7	1.4	7.2	0.0
	Sample Size	9	1,236	442	25	1
Male	Mean Length	562	610	643	638	-
	Std. Error	8.1	0.9	1.8	9.8	-
	Sample Size	19	1,217	364	19	0
Noatak River Escapement BS Sample Dates: 9/16-9/26						
Female	Mean Length	560	584	625	-	-
	Std. Error	0.0	3.1	16.3	-	-
	Sample Size	1	108	8	0	0
Male	Mean Length	517	624	642	690	-
	Std. Error	0.0	3.0	11.1	0.0	-
	Sample Size	1	99	11	1	0
Squirrel River Escapement Carcasses Sample Dates: 9/06-9/07						
Female	Mean Length	475	556	595	590	-
	Std. Error	15.0	2.6	6.4	0.0	-
	Sample Size	2	128	27	1	0
Male	Mean Length	570	607	644	-	-
	Std. Error	0.0	4.2	17.6	-	-
	Sample Size	1	68	7	0	0

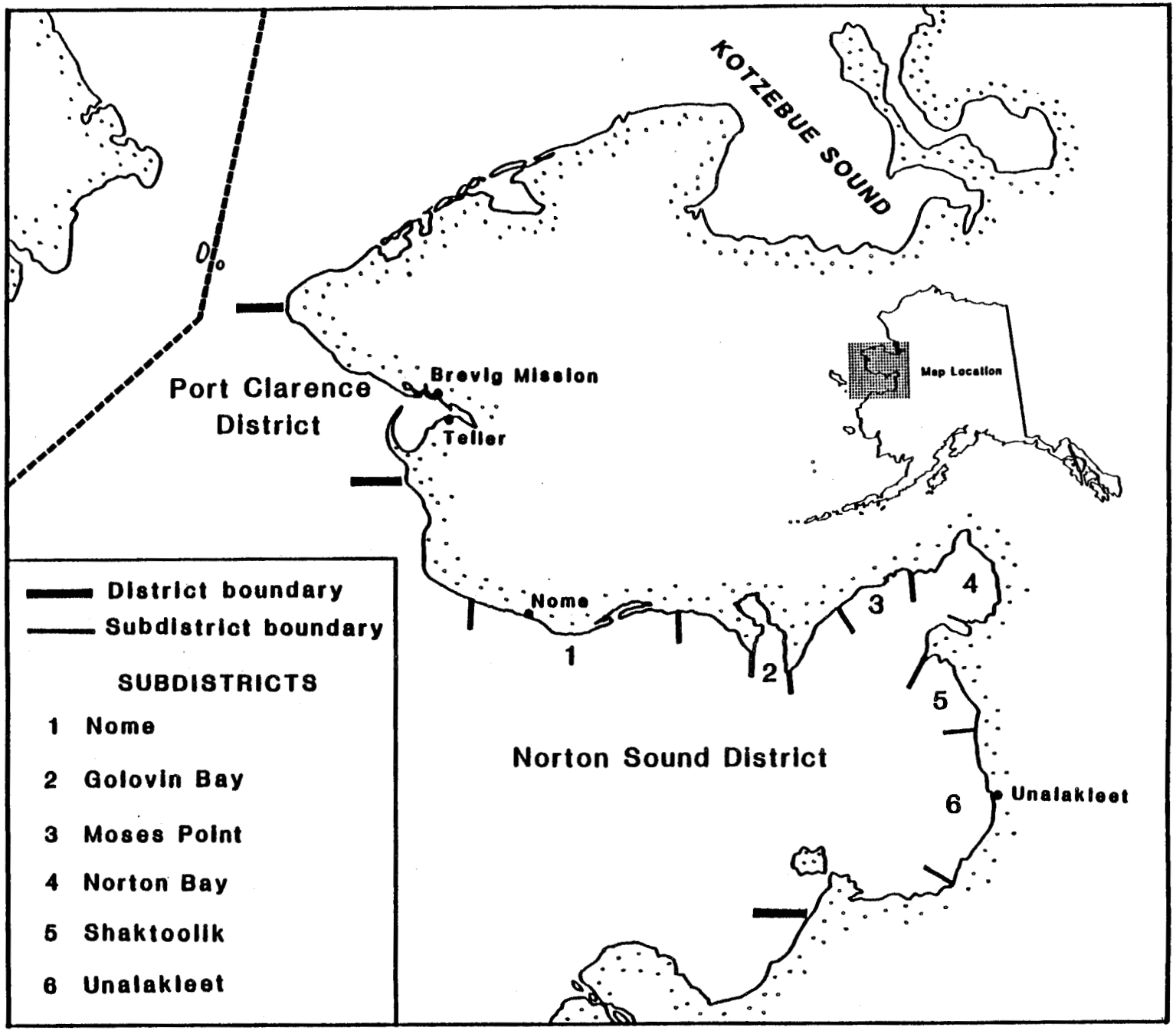

Figure 1. Norton Sound commercial salmon fishing subdistricts.

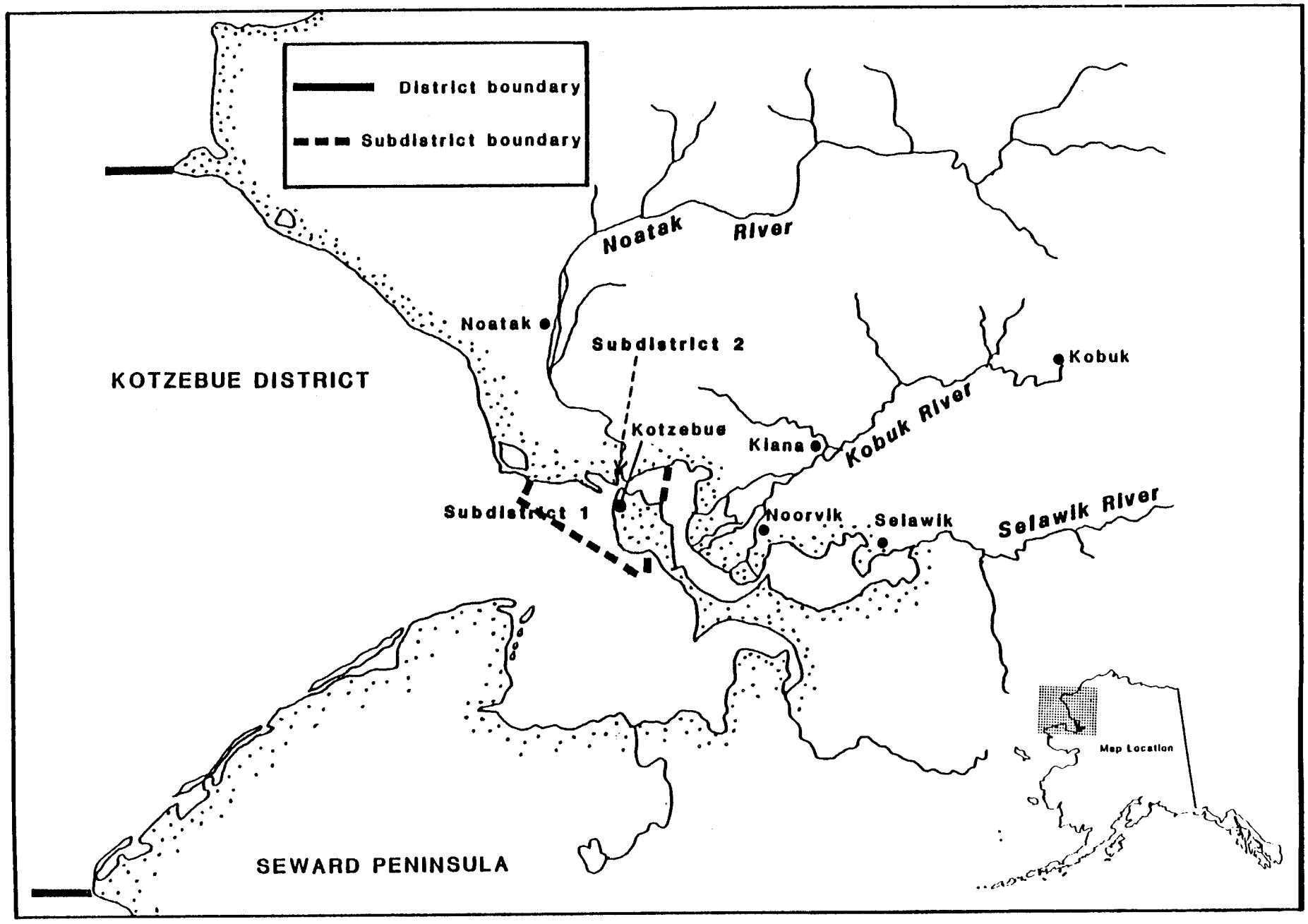

Figure 2. Kotzebue Sound commercial salmon fishing subdistricts.

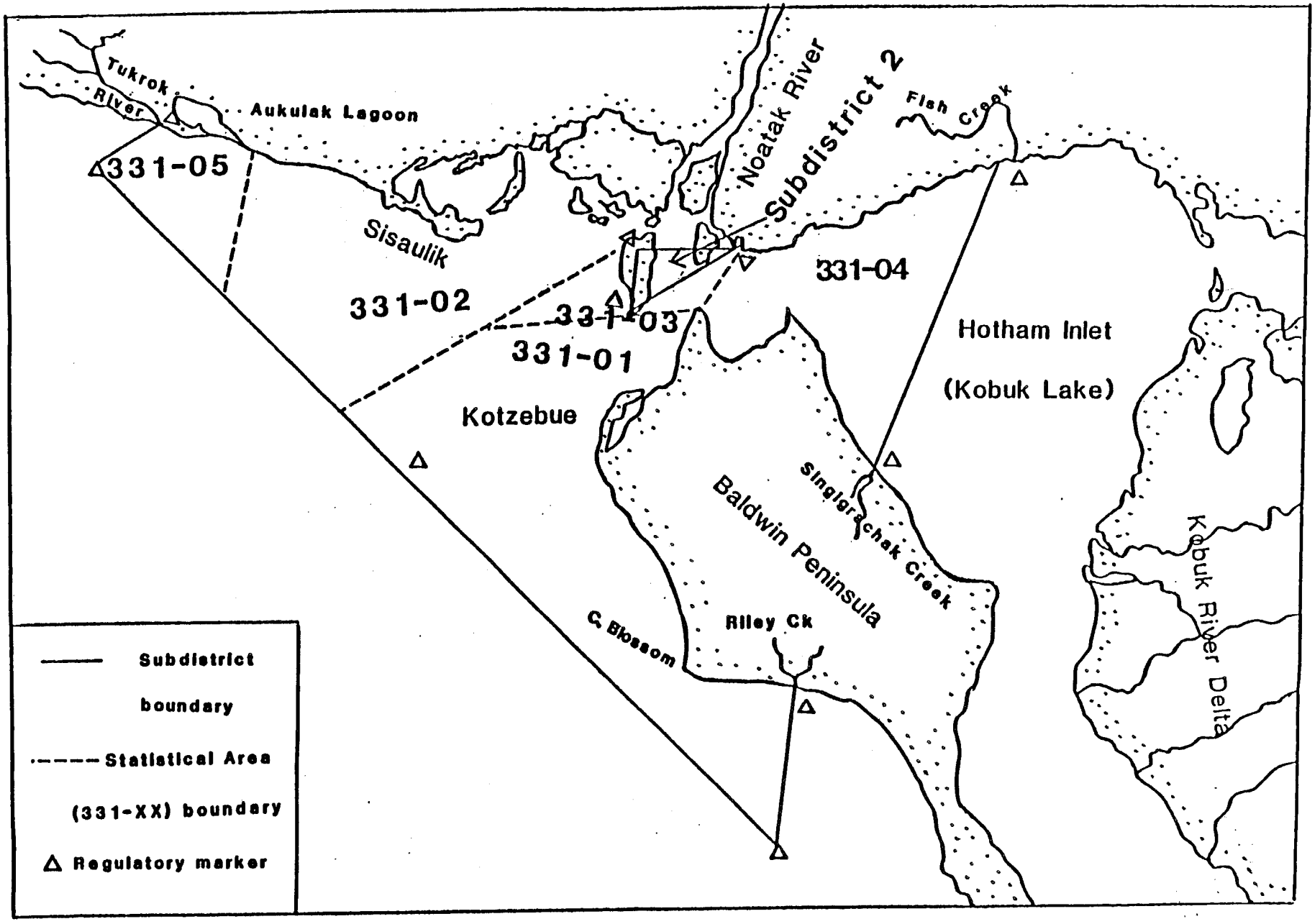

Figure 3. Kotzebue Sound commercial salmon fishing statistical areas.

APPPENDICES

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Appendix A.1. Commercial salmon set gill net effort and catch in Nome, Norton Sound Subdistrict 1, 1989.

Period	Period Dates	Period Hours	No. of Fishermen	Catch (nos.) Chinook	Chum	Pink
1	7/03-7/04	24	2	1	285	88
2	7/06-7/07	24	1	1	207	35
3[a]	7/10-7/11	24	0			
4[a]	7/13-7/14	24	0			
5[a]	7/17-7/18	24	0			
6[a]	7/20-7/21	24	0			
7[a]	7/24-7/25	24	0			
8[a]	7/27-7/28	24	0			
9[a]	7/31-8/01	24	0			
10[a]	8/03-8/04	24	0			
11[a]	8/07-8/08	24	0			
12[a]	8/10-8/11	24	0			
13[a]	8/14-8/15	24	0			
14[a]	8/17-8/18	24	0			
15[a]	8/21-8/22	24	0			
16[a]	8/24-8/25	24	0			
17[a]	8/28-8/29	24	0			
Season Total		48[b]	2	2	492	123

[a] No buyers present.
[b] Total hours actually fished.

Appendix A.2. Commercial salmon set gill net effort and catch in Moses Point, Norton Sound Subdistrict 3, 1989.

Period	Period Dates	Period Hours	No. of Fishermen	Catch (nos.) Chinook	Chum
1	6/29-6/30	24	13	62	1,667
2[a]	7/03-7/04	24	0		
3[a]	7/06-7/07	24	0		
4[a]	7/10-7/11	24	0		
5[a]	7/31-8/02	48	0		
6[a]	8/03-8/05	48	0		
7[a]	8/07-8/09	48	0		
8[a]	8/10-8/12	48	0		
9[a]	8/14-8/16	48	0		
10[a]	8/17-8/19	48	0		
11[a]	8/21-8/23	48	0		
12[a]	8/24-8/26	48	0		
13[a]	8/28-8/31	48	0		
Season Total		24[b]	13	62	1,667

[a] No buyers present.
[b] Total hours actually fished.

Appendix A.3. Commercial salmon set gill net effort and catch in Shaktoolik, Norton Sound Subdistrict 5, 1989.

Period	Period Dates	Period Hours	No. of Fishermen	Catch (nos.) Chinook	Chum	Sockeye	Coho
1	6/15-6/16	24	17	184	51	0	0
2	6/19-6/20	24	21	360	339	0	0
3	6/22-6/24	48	20	136	881	0	0
4	6/26-6/28	48	22	324	5,197	0	0
5	6/29-7/01	48	24	115	2,951	9	0
6	7/03-7/05	48	19	64	4,018	4	0
7	7/06-7/08	48	18	26	1,959	4	0
8	7/10-7/12	48	10	8	662	4	0
9	7/13-7/15	48	9	5	322	0	3
10	7/17-7/19	48	7	1	288	0	6
11	7/20-7/22	48	13	5	616	4	120
12[a]	7/24-7/26	48	0				
13	7/27-7/29	48	16	4	1,161	4	999
14	7/31-8/02	48	18	4	580	1	2,135
15	8/03-8/05	48	6	0	127	0	543
16	8/07-8/09	48	20	2	190	1	2,195
17	8/10-8/12	48	12	3	77	0	844
18	8/14-8/16	48	16	0	170	10	808
19	8/17-8/19	48	9	0	52	2	413
20[a]	8/21-8/23	48	0				
21[a]	8/24-8/26	48	0				
22[a]	8/28-8/30	48	0				
23[a]	8/31-9/02	48	0				
24[a]	9/04-9/06	48	0				
Season Total		816[b]	26	1,241	19,641	43	8,066

[a] No buyers present.
[b] Total hours actually fished.

Appendix A.4. Commercial salmon set gill net effort and catch in Unalakleet, Norton Sound Subdistrict 6, 1989.

Period	Period Dates	Period Hours	No. of Fishermen	Catch (nos.) Chinook	Chum	Sockeye	Coho
1	6/15-6/16	24	47	756	124	0	0
2	6/19-6/20	24	55	1,424	316	0	0
3	6/22-6/24	48	56	858	601	0	0
4	6/26-6/28	48	49	864	1,934	11	0
5	6/29-7/01	48	34	198	713	0	0
6	7/03-7/05	48	17	111	3,030	5	0
7	7/06-7/08	48	19	46	2,655	10	0
8	7/10-7/12	48	21	58	2,375	13	1
9	7/13-7/15	48	22	26	2,018	9	10
10	7/17-7/19	48	17	7	742	2	54
11	7/20-7/22	48	20	8	694	4	197
12	7/24-7/26	48	23	6	876	5	973
13	7/27-7/29	48	36	5	829	2	1,821
14	7/31-8/02	48	48	6	1,013	21	4,783
15	8/03-8/05	48	42	4	1,188	25	8,179
16	8/07-8/09	48	48	5	481	10	3,938
17	8/10-8/12	48	40	3	271	12	2,485
18	8/14-8/16	48	42	3	400	19	5,668
19	8/17-8/19	48	34	2	159	6	2,335
20	8/21-8/23	48	34	3	150	13	1,912
21	8/24-8/26	48	35	3	105	15	1,173
22	8/28-8/30	48	26	4	86	19	1,380
23	8/31-9/02	48	19	0	35	16	525
24	9/04-9/06	48	14	2	30	5	591
Season Total		1,152[a]	73	4,402	20,825	222	36,025

[a] Total hours actually fished.

Appendix B.1. Chum salmon commercial catch by age and sex in Kotzebue District by fishing period, 1989.

		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	7/10-7/11						
Sample Dates:	7/11						
Sample Size:	222						
Female	Percent	0.0	13.5	27.5	0.9	0.0	41.9
	Catch	0	312	635	21	0	969
Male	Percent	0.0	28.4	29.3	0.5	0.0	58.1
	Catch	0	656	677	10	0	1,343
Total	Percent	0.0	41.9	56.8	1.4	0.0	100.0
	Catch	0	969	1,312	31	0	2,312
	Std Error	0	77	77	18	0	
Stratum Dates:	7/13-7/14						
Sample Dates:	7/14						
Sample Size:	222						
Female	Percent	0.0	18.0	25.7	1.4	0.5	45.5
	Catch	0	1,072	1,528	80	27	2,707
Male	Percent	0.5	30.6	22.5	0.9	0.0	54.5
	Catch	27	1,823	1,340	54	0	3,243
Total	Percent	0.5	48.6	48.2	2.3	0.5	100.0
	Catch	27	2,895	2,868	134	27	5,950
	Std Error	27	200	200	59	27	
Stratum Dates:	7/17-7/18						
Sample Dates:	7/18						
Sample Size:	220						
Female	Percent	0.0	17.3	22.7	1.4	0.0	41.4
	Catch	0	1,969	2,590	155	0	4,714
Male	Percent	0.0	31.4	25.0	1.4	0.0	57.7
	Catch	0	3,575	2,849	155	0	6,579
Total	Percent	0.0	48.6	48.6	2.7	0.0	100.0
	Catch	0	5,543	5,543	311	0	11,397
	Std Error	0	385	385	125	0	

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		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	7/20-7/21						
Sample Dates:	7/21						
Sample Size:	227						
Female	Percent	0.0	31.3	19.8	2.6	0.0	53.7
	Catch	0	2,621	1,661	222	0	4,504
Male	Percent	0.0	33.0	10.6	2.2	0.0	45.8
	Catch	0	2,769	886	185	0	3,840
Total	Percent	0.0	64.3	30.8	4.8	0.0	100.0
	Catch	0	5,390	2,584	406	0	8,381
	Std Error	0	267	257	120	0	
Stratum Dates:	7/24-7/25						
Sample Dates:	7/25						
Sample Size:	221						
Female	Percent	0.0	31.7	24.0	0.9	0.0	56.6
	Catch	0	5,114	3,872	146	0	9,132
Male	Percent	0.5	27.6	14.5	0.9	0.0	43.4
	Catch	73	4,456	2,338	146	0	7,013
Total	Percent	0.5	59.3	38.5	1.8	0.0	100.0
	Catch	73	9,570	6,210	292	0	16,145
	Std Error	73	535	530	145	0	
Stratum Dates:	7/27-7/28						
Sample Dates:	7/28						
Sample Size:	222						
Female	Percent	0.0	23.4	19.4	0.0	0.0	42.8
	Catch	0	2,983	2,467	0	0	5,450
Male	Percent	0.0	42.8	14.4	0.0	0.0	57.2
	Catch	0	5,450	1,836	0	0	7,286
Total	Percent	0.0	66.2	33.8	0.0	0.0	100.0
	Catch	0	8,433	4,303	0	0	12,736
	Std Error	0	405	405	0	0	

- Continued -

		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	7/31-8/01						
Sample Dates:	7/31-8/01						
Sample Size:	221						
Female	Percent	0.0	32.1	16.3	0.0	0.0	48.4
	Catch	0	8,005	4,059	0	0	12,064
Male	Percent	0.0	39.4	11.8	0.5	0.0	51.6
	Catch	0	9,809	2,932	113	0	12,854
Total	Percent	0.0	71.5	28.1	0.5	0.0	100.0
	Catch	0	17,815	6,991	113	0	24,918
	Std Error	0	758	755	113	0	
Stratum Dates:	8/03-8/04						
Sample Dates:	8/04						
Sample Size:	227						
Female	Percent	0.0	34.8	10.6	0.4	0.0	45.8
	Catch	0	10,053	3,054	127	0	13,235
Male	Percent	0.4	47.1	6.2	0.4	0.0	54.2
	Catch	127	13,616	1,782	127	0	15,652
Total	Percent	0.4	81.9	16.7	0.9	0.0	100.0
	Catch	127	23,670	4,836	255	0	28,887
	Std Error	127	739	717	180	0	
Stratum Dates:	8/07-8/08						
Sample Dates:	8/07-8/08						
Sample Size:	223						
Female	Percent	0.0	38.1	7.2	0.0	0.0	45.3
	Catch	0	17,054	3,210	0	0	20,264
Male	Percent	0.4	43.0	11.2	0.0	0.0	54.7
	Catch	201	19,261	5,016	0	0	24,477
Total	Percent	0.4	81.2	18.4	0.0	0.0	100.0
	Catch	201	36,314	8,226	0	0	44,741
	Std Error	201	1,174	1,163	0	0	

- Continued -

		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	8/10-8/12						
Sample Dates:	8/10-8/11						
Sample Size:	224						
Female	Percent	0.0	47.3	5.4	1.3	0.0	54.0
	Catch	0	19,897	2,252	563	0	22,712
Male	Percent	0.9	38.8	5.4	0.9	0.0	46.0
	Catch	375	16,330	2,252	375	0	19,334
Total	Percent	0.9	86.2	10.7	2.2	0.0	100.0
	Catch	375	36,227	4,505	939	0	42,046
	Std Error	265	972	871	416	0	
Stratum Dates:	8/14-8/16						
Sample Dates:	8/15-8/16						
Sample Size:	220						
Female	Percent	0.5	50.5	5.5	0.0	0.0	56.4
	Catch	144	16,038	1,734	0	0	17,916
Male	Percent	0.9	38.6	4.1	0.0	0.0	43.6
	Catch	289	12,281	1,300	0	0	13,871
Total	Percent	1.4	89.1	9.5	0.0	0.0	100.0
	Catch	433	28,319	3,034	0	0	31,787
	Std Error	249	670	631	0	0	
Stratum Dates:	8/17-8/19						
Sampling Dates:	8/18-8/19						
Sample Size:	226						
Female	Percent	0.4	52.2	3.5	0.0	0.0	56.2
	Catch	35	4,163	282	0	0	4,480
Male	Percent	1.8	39.8	2.2	0.0	0.0	43.8
	Catch	141	3,175	176	0	0	3,493
Total	Percent	2.2	92.0	5.8	0.0	0.0	100.0
	Catch	176	7,338	459	0	0	7,973
	Std Error	78	144	124	0	0	

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		Brood Year and Age Group					
		1986	1985	1984	1983	1982	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum Dates:	8/21-8/23						
Sample Dates:	8/22-8/23						
Sample Size:	223						
Female	Percent	1.3	55.6	4.9	0.9	0.0	62.8
	Catch	140	5,787	513	93	0	6,534
Male	Percent	1.3	34.5	1.3	0.0	0.0	37.2
	Catch	140	3,594	140	0	0	3,874
Total	Percent	2.7	90.1	6.3	0.9	0.0	100.0
	Catch	280	9,381	653	93	0	10,408
	Std Error	113	208	169	66	0	
Stratum Dates:	8/24-8/26						
Sample Dates:	8/25-8/26						
Sample Size:	219						
Female	Percent	0.5	63.9	4.1	0.0	0.0	68.5
	Catch	21	2,905	187	0	0	3,113
Male	Percent	0.5	29.7	0.9	0.5	0.0	31.5
	Catch	21	1,349	42	21	0	1,432
Total	Percent	0.9	93.6	5.0	0.5	0.0	100.0
	Catch	42	4,254	228	21	0	4,545
	Std Error	29	75	67	21	0	
Stratum Dates:	8/28-8/30						
Sample Dates:	8/29-8/30						
Sample Size:	219						
Female	Percent	1.4	46.1	2.7	1.4	0.0	51.6
	Catch	33	1,103	66	33	0	1,234
Male	Percent	1.4	42.0	4.6	0.5	0.0	48.4
	Catch	33	1,004	109	11	0	1,157
Total	Percent	2.7	88.1	7.3	1.8	0.0	100.0
	Catch	66	2,107	175	44	0	2,391
	Std Error	26	52	42	22	0	

Appendix B.2. Thousands of chum salmon in the Kotzebue District commercial catch by age group, 1962-1989.

Year	Sample Size[a]	Age Class[b] 0.2	0.3	0.4	0.5	Total
1962	69	9.5	82.2	36.4	1.8	129.9
1963	255	16.4	27.7	10.1	0.2	54.4
1964	463	40.7	34.5	1.3	0.0	76.5
1965	480	0.9	36.4	2.7	0.0	40.0
1966	430	3.1	20.7	7.0	0.0	30.8
1967	1,865	2.6	21.3	5.4	0.1	29.4
1968	1,989	6.4	17.5	6.0	0.3	30.2
1969	1,125	21.8	34.6	2.9	0.0	59.3
1970	267	6.2	145.4	8.1	0.0	159.7
1971	1,105	11.0	103.2	40.8	0.0	155.0
1972	980	26.8	100.9	41.0	1.0	169.7
1973	598	62.7	260.9	51.8	0.0	375.4
1974	350	179.0	398.7	49.0	1.2	627.9
1975	340	14.1	488.9	60.3	0.0	563.3
1976	566	17.9	82.2	59.4	0.2	159.7
1977	446	13.1	143.1	36.4	3.3	195.9
1978	579	11.7	64.1	35.5	0.2	111.5
1979	658	43.3	75.3	21.5	1.4	141.5
1980	710	55.5	286.9	24.2	0.7	367.3
1981	1,167	16.3	453.7	207.2	0.0	677.2
1982	983	24.7	201.7	168.4	23.0	417.8
1983	1,979	10.2	101.6	60.1	3.9	175.8
1984	2,933	46.7	206.2	63.1	4.2	320.2
1985	3,293	2.3	436.4	80.6	2.1	521.4
1986	3,095	0.8	48.6	206.3	5.7	261.4
1987[c]	1,987	14.8	45.4	36.6	12.7	109.5
1988	3,324	21.5	263.6	60.8	6.8	352.7
1989	3,336	1.8	198.2	51.9	2.6	254.6
10 yr avg (1979-1988)		23.6	211.9	92.9	6.1	334.5

[a] Sample size in numbers of fish.

[b] Age 0.6, which contributes less than 1% of the commercial harvest in any given year, is not included here.

[c] Adjusted percentages for 1987 include estimates of age composition for closed fishing periods.

Appendix B.3. Percent age and and sex composition of chum salmon samples taken from the Kotzebue District commercial fishery, 1962-1989.

Year	Sample Size[a]	Males	Females	Age Class[b] 0.2	0.3	0.4	0.5
1962	69	26.1	73.9	7.3	63.3	28.0	1.4
1963	255	35.0	65.0	30.1	50.9	18.6	0.4
1964	463	43.6	56.4	53.3	45.1	1.7	0.0
1965	480	42.1	57.9	2.3	91.0	6.7	0.0
1966	430	40.2	59.8	10.1	67.1	22.8	0.0
1967	1,865	37.3	62.7	8.8	72.3	18.5	0.5
1968	1,989	48.2	51.8	21.2	58.0	19.8	0.9
1969	1,125	53.7	46.3	36.8	58.3	4.9	0.0
1970	267	45.3	54.7	3.9	91.0	5.1	0.0
1971	1,105	54.6	45.4	7.1	66.6	26.3	0.0
1972	980	50.9	49.1	15.8	59.4	24.1	0.6
1973	598	46.0	54.0	16.7	69.5	13.8	0.0
1974	350	47.1	52.9	28.5	63.5	7.8	0.2
1975	340	46.4	53.6	2.5	86.9	10.7	0.0
1976	566	47.9	52.1	11.2	51.6	37.2	0.1
1977	446	49.3	50.7	6.7	73.0	18.6	1.7
1978	579	49.9	50.1	10.5	57.5	31.8	0.2
1979	658	53.3	46.7	30.6	53.2	15.2	1.0
1980	710	56.4	43.6	15.1	78.1	6.6	0.2
1981	1,167	52.4	47.6	2.4	67.1	30.6	0.0
1982	983	48.8	51.2	5.9	48.3	40.3	5.5
1983	1,979	43.4	56.6	5.8	57.8	34.2	2.3
1984	1,933	50.2	49.8	14.6	64.3	19.7	1.3
1985	3,293	47.8	52.2	0.4	83.7	15.5	0.4
1986	3,095	46.0	54.0	0.3	18.6	78.9	2.2
1987[c]	1,987	50.6	49.4	13.5	41.5	33.4	11.6
1988	3,324	47.8	52.2	6.1	74.7	17.2	1.9
1989	3,336	49.3	50.7	0.7	77.9	20.4	1.0
10 yr avg (1979-1988)		49.7	50.3	9.5	58.7	29.1	2.7

[a] Sample size in numbers of fish.

[b] Age 0.6, which contributes less than 1% of the commercial harvest in any given year, is not included here.

[c] Adjusted percentages for 1987 include estimates of age composition for closed fishing periods.